

# Superhydrophobic cotton to clean marine oil spill

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**In news-** Researchers at the IIT, Guwahati, have developed a new class of super-hydrophobic cotton composite with Metal-Organic Framework (MOF) that promises marine oil-spill clean-up in near future.

## About super-hydrophobic cotton-

- It is a **highly porous and water-repellent super-hydrophobic cotton composite material containing MOF.**
- It can **absorb oil selectively from an oil-water mixture.**
- The MOF composite has great **capability for selective separation of the oils from oil / water mixtures** and the separation efficiency lies between 95 per cent and 98 per cent, irrespective of the chemical composition and density of the oils.
- Besides, the **MOF composite is also able to absorb large volumes of oils and can be reused for a minimum of 10 times** so that the sorbents can provide more recovery of the spilled oil.
- **Both heavy and light oils can be effectively absorbed by the material,** which is easy to prepare, cost-effective and recyclable
- Its goal was to develop a new material which could be synthesised easily and should be cost-effective.
- The **researchers have grown a new MOF material on the surface of medical cotton, which is environmentally friendly and cost effective.**
- Such low-cost material will reduce the production cost of the material for large-scale synthesis for real applications, compared to currently available materials.
- The team initially developed a super-hydrophobic MOF

which can repel the water and float on the water surface. Then, they grew the same MOF on the surface of medical cotton.

- It was observed that the **medical cotton changes from hydrophilic to super-hydrophobic material** and can float on the water surface.
- **The MOF-coated cotton fibre composite showed water repellency** with a water contact angle of  $163^\circ$ .
- The flexible super-hydrophobic MOF composite showed an oil absorption capacity of more than 2500 wt per cent.
- Motor oil, kerosene and gasoline were used by the team in this study to investigate the real-life potential of the material for oil-spill clean-up.
- **The research team has also demonstrated the separation of oil from oil / water mixture by simple gravity-directed filtration** and also a collection of underwater oil against gravity.

### **What are Metal-Organic Frameworks (MOFs)?**

**MOFs are a class of compounds containing metal ions coordinated to organic ligands to form 3D structures**, with the special feature that they are often **highly porous materials that act like a sponge**.

### **What is Oil spill?**

An oil spill is the release of a liquid petroleum hydrocarbon into the environment, especially the marine ecosystem, due to human activity, and is a form of pollution. The term is usually given to marine oil spills, where oil is released into the ocean or coastal waters, but spills may also occur on land.

### **International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC)-**

- It is an international maritime convention establishing measures for dealing with marine oil pollution incidents

nationally and in cooperation with other countries.

- As of November 2018, there are 112 state parties to the convention.
- The OPRC Convention was drafted within the framework of the International Maritime Organization (IMO) and adopted in 1990 entering into force in 1995.
- In 2000 a Protocol to the Convention relating to hazardous and noxious substances (HNS) was adopted (the OPRC-HNS Protocol).
- In accordance with this Convention and its Annex, States-Parties to the 1990 Convention undertake, individually or jointly, to take all appropriate measures to prepare for and respond to oil pollution incidents.

**The practical applications of this research include** Cleaning the spilled oil from environmental water (river, sea or ocean water) during oil transportation with high efficiency and large absorption capacity, thus reducing environmental water pollution.